

PYCNOGONIDA OF THE WESTERN PACIFIC ISLANDS I. THE MARSHALL ISLANDS

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Abstract.—This first report on Pycnogonida from the Marshall Islands lists 6 shallow water species. These are: *Ammothella stauromata*, new species; *Anoplodactylus glandulifer* Stock, previously known from the Red Sea to Singapore; *Anoplodactylus marshallensis*, new species; *Endeis nodosa* Hilton, known only from Hawaii in past reports, with a male figured for the first time; specimens very near *Callipallene novaezealandiae* (Thomson), a species not known from the western north Pacific; and *Nymphon micronesicum*, new species. The new species are apparently not closely related to Pacific mainland pycnogonids.

There are no previous reports on pycnogonids from the Marshall Islands and, indeed, practically nothing is known of the pycnogonids inhabiting the vast expanse of Micronesia. Only 2 Micronesian species are reported in the literature, each from a single locality in the Caroline Islands (Stock 1968:10, 49). Tropical Pacific island pycnogonids have received some study in limited localities by Loman (1908) for Indonesia, Stock (1953) for Indonesia and the Philippines, Hilton (1942a) for Hawaii, and Stock (1968) for several Pacific localities, with a few short reports by others (Child 1970, Society Islands and Tuamotus; Child and Hedgpeth 1971, Galapagos; Clark 1973, New Britain and Tonga; Child 1977, French Oceania). The pycnogonid fauna of Australia, New Zealand, and continental Pacific borders is better known, probably because it is more accessible to collectors.

The Micronesian fauna could be expected to contain species common to other parts of the tropical Pacific and at least 3 of the Marshall Island species reported here are found elsewhere in the Pacific. The remaining 3 species are new, reflecting the lack of benthic collections from Micronesia. The atolls and small volcanic islands of Micronesia are of particular interest to the taxonomist because of the restriction or absence of habitats such as muddy estuaries, algal encrusted rocky shores, and beds of sea grasses. These restrictions limit many marine faunules, including pycnogonids, to coral or coral sand and rubble, sponges, and a few other sessile sources of food. Coelenterates are a preferred food of many pycnogonids, many of which have been collected in association with coral reefs. I predict that there will be a much larger pycnogonid fauna found associated with the reefs of the Marshall Islands and other Pacific islands and atolls than is described in this short report.

The majority of these specimens were collected by the author during a Smithsonian Enewetak Atoll survey in 1969. Additional specimens were loaned by the B. P. Bishop Museum of Honolulu, Hawaii.

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Devaney of the B. P. Bishop Museum for loaning the additional specimens. The specimens marked (BPBM) are deposited in the Bishop Museum. All other specimens are deposited in the National Museum of Natural History under the catalog numbers of the old U.S. National Museum (USNM). I wish to thank Dr. Thomas E. Bowman, Department of Invertebrate Zoology (Crustacea), National Museum of Natural History, for critically reviewing the manuscript.

Family Ammotheidae

Ammothella stauromata, new species

Fig. 1

Material examined.—N end of Enewetak Island, on pilings of large marine pier in 0.3–1.8 m, 11°21'48"N, 162°21'10"E, Child sta. 39–69, 12 Oct. 1969, 1 male holotype, USNM 189275, and 6 juvenile paratypes, USNM 189276. Pilings of small wooden pier at N end of Enewetak Island in 1.5 m, 11°21'52"N, 162°21'15"E, Child sta. 25–69, 29 Sept. 1969, 7 juvenile paratypes, USNM 189277.

Description.—Moderately small, adult leg span just under 14 mm. Trunk *Ascorhynchus*-like with slender median tubercles taller than their segment diameter. Trunk segmentation flaring with each segment anterior inserted into posterior large cowl of each preceding segment. Lateral processes separated by distances slightly greater than their diameters, twice as long as their maximum diameters, and armed with short slender dorsodistal tubercles and lateral setae shorter than segment diameter. Lateral setae arranged only on posterior 6 lateral processes: 1 on posterior of second lateral processes; 1 on anterior and posterior of third and fourth processes. First lateral processes without setae. Ocular tubercle a cylinder as tall as median trunk tubercles, placed at anterior of cephalic segment, with darkly pigmented eyes at rounded tip. Abdomen cylindrical, slightly swollen distally, longer than median tubercles, carried almost erect, armed with several short distal setae.

Proboscis moderately inflated with broad flat lips just distal to slight constriction.

Chelifores 3-segmented, slender, with small ovoid vestigial chelae having only hint of fingers. First segment short, with slender dorso-distal tubercle longer than segment diameter, without setae. Second segment 2.5 times length of first, without tubercles but with fringe of distal setae as long or longer than segment diameter.

Palps 9-segmented, originating from bulbous tubercles placed anterolaterally on cephalic segment ventral to ocular tubercle. Each bulbous tubercle with a slender, short, obliquely-pointing tubercle. Palp slender, second and fourth segments with single long lateral seta and several short setae. Distal segments with many short ventral and lateral setae.

Oviger 10-segmented, originating ventral to first lateral processes. First 5 segments with few short setae, sixth with 8 or 9 short setae, seventh with 2 long lateral setae, and terminal 3 segments (strigilis) with 2 denticulate spines on each segment. Spines with many serrations per side.

Third leg: first coxa with slender dorsodistal tubercle not as long as segment diameter, with shorter tubercle anteriolateral to this, segment armed with anterior, posterior and ventral setae. Coxa 2 with 1 dorsal seta and several short distal setae, with slender ventrodistal sexual pore tubercle having several distal setae.

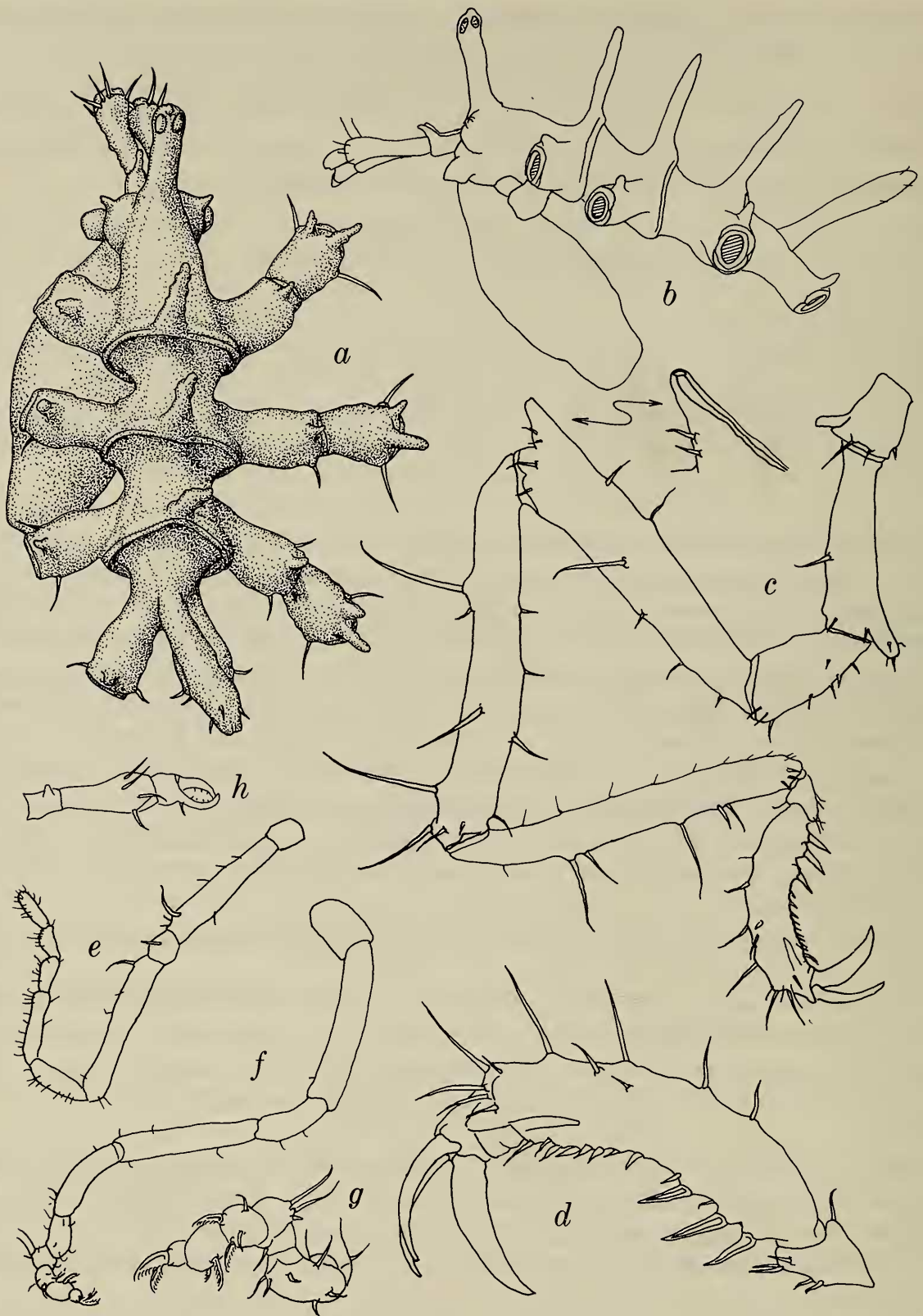


Fig. 1. *Ammothella stauromata*, holotype, male: a, Trunk, dorsal view; b, Trunk, lateral view; c, Third leg with enlargement of cement gland; d, Terminal segments of third leg, enlarged; e, Palp; f, Oviger; g, Terminal segments of oviger, enlarged; h, Juvenile chelafore.

Tubercle almost as long as segment diameter. Coxa 3 with several ventral setae. Femur armed with single long anterior and posterior midlateral setae, several ventral short setae, fringe of distal setae, and dorsodistal broad tubercle carrying cement gland tube along its dorsal length. Tibia 1 the longest segment, tibia 2 shorter than femur, both armed with few dorsal and lateral setae longer than segment diameter and several shorter ventral setae. Tarsus very short, triangular, with 1 dorsal seta and 4 or 5 ventral short setae. Propodus robust, strongly curved, armed with 3 stout heel spines, 10 or 11 short sole spines, several dorsal setae, the longest slightly longer than segment diameter, and a fringe of distal setae. Claw moderately curved, about 0.4 length of propodus. Auxiliary claws almost as long as main claw.

Measurements of holotype (in mm).—Trunk length (tip of ocular tubercle to tip 4th lateral processes), 1.74; trunk width (across 2nd lateral processes), 1.06; proboscis (lateral), 1.23; abdomen (lateral), 0.71; 3rd leg, coxa 1, 0.32; coxa 2, 0.69; coxa 3, 0.47; femur, 1.35; tibia 1, 1.42; tibia 2, 1.25; tarsus, 0.18; propodus, 0.68; claw, 0.27.

Distribution.—Known only from the type-locality, Enewetak Island, Enewetak Atoll, in the intertidal.

Etymology.—The species name is Greek and means a palisade or stockade, this pertaining to the palisaded appearance of the tall ocular tubercle, median trunk tubercles and abdomen as seen in lateral view.

Remarks.—There are few *Ammothella* species with tall median trunk tubercles. Those that appear to be closest to this new species are *Ammothella setosa* Hilton, 1942b, *A. menziesi* Hedgpeth, 1951, *A. thetidis* Clark, 1963, and *A. exornata* Stock, 1975b. Of these, *A. stauromata* is least like *A. exornata*, a very small compact species with many coxae, chelifore and lateral process tubercles and a tuberculate ocular base. The median trunk tubercles of *A. menziesi* are shorter than the ocular tubercle and are blunt finger-like projections, unlike those of *A. stauromata*. Hedgpeth's species is also notably larger than *A. stauromata*. The 2 species most similar to this new species are *A. setosa* and *A. thetidis*. They are both slender graceful species with lateral processes well separated, but unlike *A. stauromata*, neither has a median trunk tubercle on the cephalic segment and their chelifores are much longer and more slender.

Family Phoxichilidiidae
Anoplodactylus glandulifer Stock

Anoplodactylus spec., Calman, 1923:289.

Anoplodactylus glandulifer Stock, 1954:80–84, fig. 36; 1958:3; 1968:49; 1974:16–17.—Arnaud, 1973:955, figs. 1, 2.

Material examined.—N end of Enewetak Island, pier pilings of large marine pier in 0.3–1.8 m, 11°21'48"N, 162°21'10"E, Child sta. 39–69, 12 Oct. 1969, 1 ♂ with eggs.

Remarks.—This single male (a larval specimen accompanied the male, but it is too juvenile for determination and may not be this species) is slightly smaller than the measurements given by Stock (1954:84). It varies in other small details: the lateral processes are more closely spaced; there are fewer teeth on the chela

fingers; there are only very low palp buds with no discernable segmentation line; the propodal lamina is shorter, but is still longer than half the sole length; and the second oviger segment is longer than that shown for the type. There are also 3 cement glands on each femur of all legs. Stock found either 2 or 3 glands on legs of the type. This egg-carrying specimen is otherwise the same as the type-specimen, also a male.

The known distribution of this species, previously from the Red Sea and east coast of Africa to Burma and Singapore in depths from littoral to 5 meters, is now extended to the Marshall Islands littoral.

Anoplodactylus marshallensis, new species

Fig. 2a-f

Material examined.—N end of Enewetak Island, on pier pilings of large marine pier in 0.3–1.8 m, 11°21'48"N., 162°21'10"E., Child sta. 39–69, 12 Oct. 1969, 1 ♂ with eggs, holotype (USNM 189278), 2 ♂, 1 ♀ ovigerous, 1 ♀, 4 juveniles, paratypes (USNM 189279). N end of Enewetak Island, pilings of small wooden pier in 1.5 m, 11°21'52"N, 162°21'15"E, Child sta. 25–69, 29 Sept. 1969, 1 ♂ with eggs, 1 larva, paratypes (USNM 189280).

Description.—Very small, leg span only slightly over 4 mm. Trunk robust, ovoid in dorsal aspect, unsegmented. Lateral processes glabrous, separated by distances equal to half their diameter, each only slightly longer than its diameter. Ocular tubercle a moderately tall cone inflated at midlength with unpigmented eyes, with lateral papillae distal to eyes. Neck fairly short, without setae. Abdomen slightly shorter than ocular tubercle, curved dorsally, armed with 3 or 4 distal setae.

Proboscis a cylinder tapering distally to rounded lips, without constrictions.

Palps entirely lacking.

Chelifores robust, club-shaped, curved ventrally in lateral aspect, armed with 1 or 2 dorsodistal setae. Chela tiny, palm ovoid, longer than fingers, armed with 3 or 4 short distal setae. Immobile finger slightly curved, with 1 seta, movable finger with greater curve, crossing immobile finger at tip, armed with 3 setae. Fingers without teeth.

Oviger moderately short, second segment curved, third straight and the longest segment, both armed with several short setae. Fourth segment only slightly longer than fifth, sixth round, no longer than wide. Fifth and sixth armed with several setae longer than segment diameters.

Legs moderately short, armed with very few setae and a very long dorsodistal seta on each major segment. Femur the longest segment, with tibia 1 longer than tibia 2. Single cement gland a flask-shaped distally-pointing tube shorter than segment diameter. Body of tube creased with many circumferential constrictions when seen under high magnification. Tarsus very short, almost triangular, armed with 3 or 4 short ventral setae. Propodus robust, almost straight, with marked heel bearing 1 stout spine and 4 short setae. Sole armed with 5 or 6 short curved spines, a very short lamina and several lateral and distal setae. Claw moderately curved, robust, two-thirds propodal length. Auxiliary claws entirely lacking.

Measurements of holotype (in mm).—Trunk length (chelifore insertion to tip 4th lateral processes), 0.68; trunk width (across 1st lateral processes), 0.45; pro-

boscis length (lateral), 0.28; abdomen length (lateral), 0.14; 3rd leg, coxa 1, 0.14; coxa 2, 0.24; coxa 3, 0.14; femur, 0.38; tibia 1, 0.33; tibia 2, 0.28; tarsus, 0.06; propodus, 0.25; claw, 0.17.

Distribution.—Known only from the type-locality, Enewetak Island, Enewetak Atoll, in littoral depths.

Etymology.—Named for the Marshall Islands, its type-locality.

Color notes.—When freshly collected, all 11 specimens displayed a distinctive red color pattern. The white trunk bore a purplish red longitudinal stripe mid-dorsally from the abdomen tip to the posterior surface of the ocular tubercle. This stripe was bordered in darker red and was a dark blood-red at the ocular tubercle. The tibiae each had the same dorsal coloration with tibia 2 slightly darker. The remainder of the legs and all other appendages were white. After several months in alcohol, these colors had entirely disappeared. The coloration appeared to be in the chitinous integument itself and not associated with the gut diverticula where coloration is more often found among the pycnogonids.

Remarks.—This small species is without many distinctive characters except for the coloration described above. It appears to be morphologically related to *Anoplodactylus quadratispinosus* Hedgpeth, 1943, and to *A. inermis* Losina-Losinsky, 1961. Both share with the new species the characters of a tall conical ocular tubercle, a distinctive large heel on the propodus, and a trunk with lateral processes separated by distances equal to or less than their diameter. Several other characters immediately separate this new species from the others. It has much shorter leg segments, shorter and more robust chelifores, a smaller proboscis, shorter lateral processes, and an unsegmented trunk. Losina-Losinsky's species is only known from females, but the characters above would serve equally to separate *A. marshallensis* from a male of *A. inermis*.

The small robust shape of this new species is so far unique to the genus *Anoplodactylus* from the western Pacific.

Family Endeidae
Endeis nodosa Hilton
Fig. 2g-i

Endeis (Phoxichilus) nodosa Hilton, 1942a:47-48, fig. 4.

Endeis nodosa.—Stock, 1968:59 [key].

Material examined.—Runit (site name Yvonne) Island, pier pilings on lagoon side in 0-0.7 m, 11°32'40"N, 162°21'53"E, Child sta. 36-69, 8 Oct. 1969, 2 ♀ (USNM). Enewetak Island, on lagoon rocks in 4 meters, J. Lamberson, Jan. 1976, 1 ♀ (BPBM). Hawaii, Honolulu Harbor on boat hawser, O. Degener, Apr. 1947, 1 ♂ with eggs (USNM).

Remarks.—This species has never been adequately figured and since the male has never been recorded in the literature, I include a set of figures here of the Honolulu male specimen. The species is rather distinctive in a genus with many species difficult to separate. The intestinal diverticula in each leg have many blind caeca or pockets and the femur has a large ventral triangular projection on each leg. *Endeis flaccida* Calman, 1923, is a similar species, but is without the ventral femoral projection.

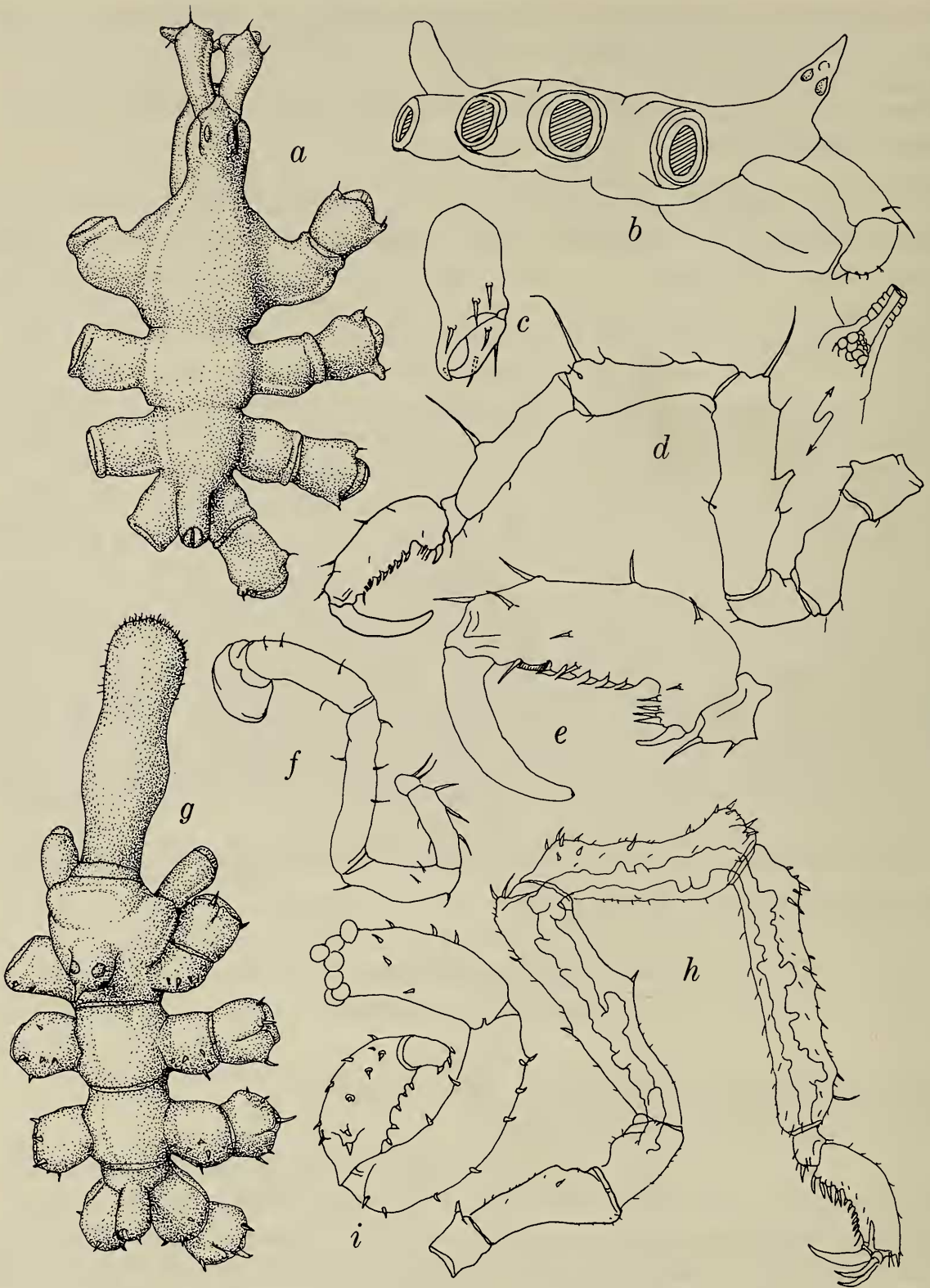


Fig. 2. *Anoplodactylus marshallensis*, holotype, male; a, Trunk, dorsal view; b, Trunk, lateral view; c, Chela; d, Third leg with enlargement of cement gland; e, Terminal segments of third leg, enlarged; f, Oviger. *Endeis nodosa*, male: g, Trunk, dorsal view; h, Third leg, showing gut diverticula; i, Terminal segments of oviger with eggs.

This species is probably not rare but only rarely reported because its habitats are seldom sampled. It was known previously only from Hawaii in the littoral and its distribution is now extended westward to the Marshall Islands at Enewetak Atoll.

Family Callipallenidae

Callipallene sp. cf. *C. novaezealandiae* (Thomson)

Pallene novae-zealandiae Thomson, 1884:246–247, pl. 14, figs. 1–4.—Hutton, 1904:247.

Callipallene brevirostris ssp. *novae-zealandiae*.—Stock, 1954:48–50, fig. 21a–h.

Callipallene brevirostris cf. ssp. *novaezealandiae*.—Arnaud, 1972:162.

Callipallene brevirostris novaezealandiae.—Child, 1975:10.

Callipallene brevirostrum ssp. *novaezealandiae*.—Stock, 1975a:132.

Material examined.—Large coral knoll in lagoon near Chinieero (site name Alvin) Island in filamentous green algae at 3–5 m, 11°29'05"N, 162°23'25"E, Child sta. 05-69, 22 Sept. 1969, 1 ♀ (USNM). Enewetak Island, lagoon side, in rubble at 4 m, Brock, 27 Sept. 1975, 1 ♂ (BPBM).

Remarks.—These 2 specimens are quite close to Thomson's species and agree for the most part with his figures. The ovigers bear fewer denticulate spines than either Thomson's figure 3, or Stock's descriptions of his specimens. The specimens in hand have a denticulate spine count of 6:5:5:5, and 6:5:5:6, while Thomson's female has a count of 8:8:7:8, and Stock's male has 8:8:8:7 and his female 8:7:6:8 spines. This is the only significant difference I can find between these Enewetak specimens and the detailed figures and descriptions given by Thomson and Stock. It is possible that these specimens represent a new species, but with only 2 specimens in hand and the close agreement between these and most characters of Thomson's species, I regard them provisionally as near to, if not conspecific with his New Zealand species.

This species has never been reported from tropical western Pacific localities. Its known distribution has been from New Zealand and Australia to the western Indian Ocean at Madagascar and Tanzania, in mostly shallow depths. If these specimens are in fact Thomson's species, then the distribution is extended to the northern hemisphere for the first time, in the Marshall Islands.

Family Nymphonidae

Nymphon micronesicum, new species

Fig. 3

Material examined.—Bikini Atoll, Namu Island, outer reef, 11°42'N, 165°17'E, M. W. Johnson, 4 Apr. 1946, 1 ♀, holotype (USNM 189274).

Description.—Female (male unknown): of moderately small size, leg span almost 15 mm. Trunk robust, segments slightly inflated, fully segmented. Lateral processes separated by distances slightly greater than or equal to their diameters, only as long as their diameters, armed with few tiny setae. Neck moderately long, with segmentation line (possible artifact) at narrowest diameter directly anterior to oviger implantation which is slightly anterior to but not touching first lateral

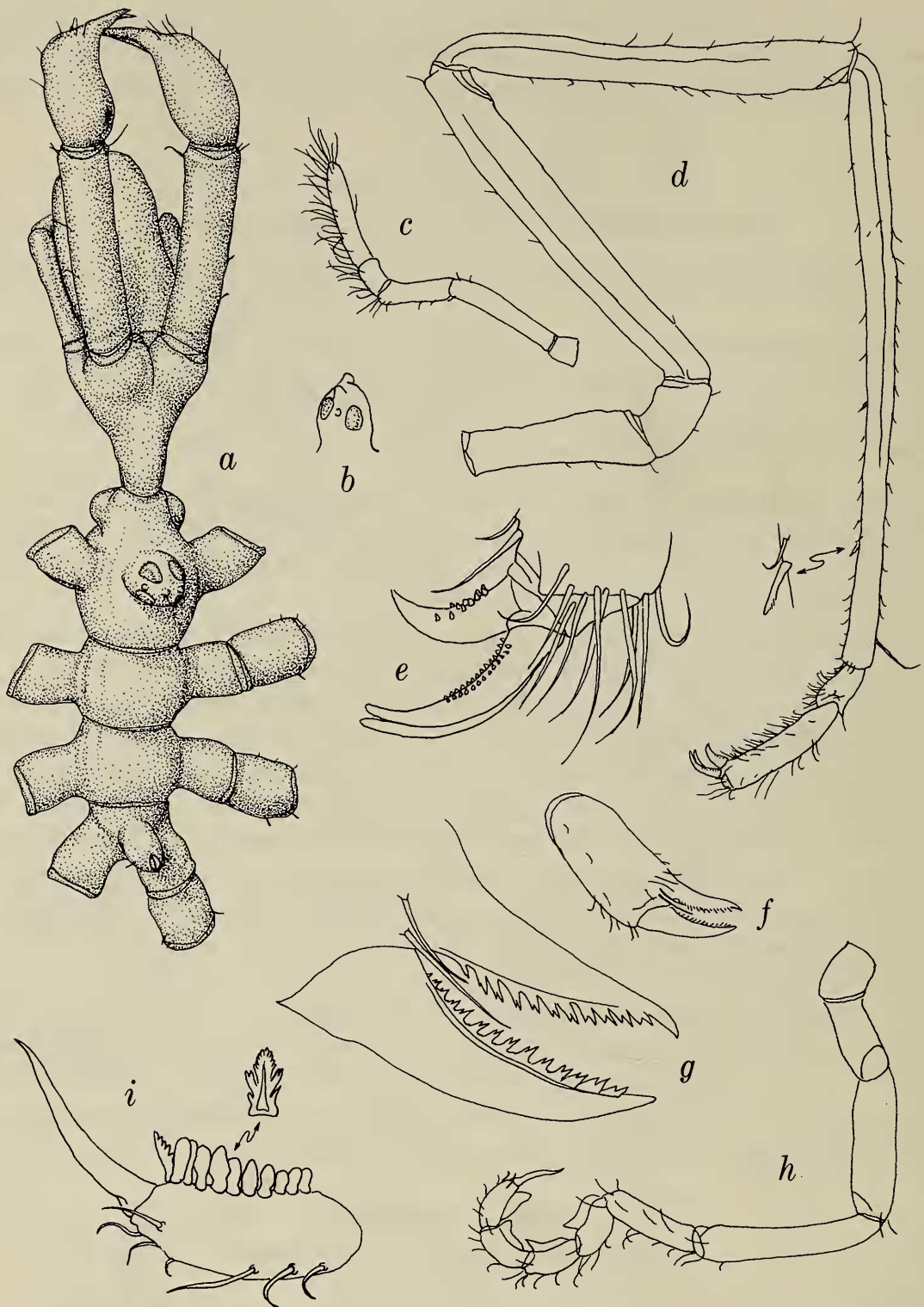


Fig. 3. *Nymphon micronesicum*, holotype, female: a, Trunk, dorsal view; b, Ocular tubercle, lateral view; c, Palp; d, Third leg with enlargement of ventral spine; e, Distal propodus and claws, enlarged; f, Chela; g, Fingers of chela, enlarged; h, Oviger; i, Terminal segment of oviger with a denticulate spine, enlarged.

processes. Ocular tubercle slightly taller than its diameter, implanted over first lateral processes, rounded, with 2 lateral papillae and tiny apical papilla. Eyes large, slightly pigmented. Abdomen short, erect, no taller than ocular tubercle, armed with 2 laterodistal setae.

Proboscis a slightly swollen cylinder tapering distally to rounded lips.

Chelifore scapes large, cylindrical, 4 times as long as their diameters, armed with several lateral setae. Chela shorter than scape, palm longer than fingers, armed with several dorsal and distal fringe of setae. Fingers broad, immovable finger straight, armed with 11 or 12 bicuspidate teeth. Movable finger moderately curved, armed with 12 or 13 bicuspidate teeth. Finger tips not overlapping.

Palp short, second segment longest, terminal segment only slightly shorter. Third segment 0.6 length of second, armed with ventrodistal setae. First and fourth segments only slightly longer than wide. Fourth and fifth segments armed with many setae slightly longer than segment diameter.

Oviger segments 4 and 5 subequal, armed with several distal setae. Sixth segment cylindrical, 0.5 length of fourth, armed with lateral and dorsal setae. Strigilis 4 segments armed with dorsal and lateral setae and denticulate spines in the formula 11:9:9:10. Spines with 2 proximal large serrations and several smaller distal serrations per side. Terminal claw as long as terminal segment, without endal teeth or denticulations.

Leg segments slender, tibia 2 the longest segment, 0.3 longer than tibia 1 and femur which are subequal in length. Major segments armed with short dorsal and ventral setae increasing in numbers distally. Tibia 2 armed with 2 ventrodistal spines, each with several endal crenulations. Tarsus and propodus short; tarsus 0.4 length of propodus, both armed with many slender setae and broader spines on sole. Propodus without heel or larger heel spines. Major claw short, very curved, armed with 2 rows of low conical rugosities endally. Auxiliary claws longer than main claw, each armed with 2 rows of tiny serrations or teeth endally.

Measurements (in mm).—Trunk, first segment, 0.89; posterior 3 segments, 0.7; width (across 2nd lateral processes), 0.67; proboscis length, 0.67; abdomen length, 0.16; 3rd leg, coxa 1, 0.23; coxa 2, 0.64; coxa 3, 0.4; femur, 1.4; tibia 1, 1.48; tibia 2, 2.08; tarsus, 0.2; propodus, 0.47; claw, 0.1; auxiliary claws, 0.13.

Distribution.—Known only from the type-locality, Namu Island, Bikini Atoll, in a shallow but unrecorded depth.

Etymology.—Named for Micronesia, a place of “small islands,” a number of which form Bikini Atoll, the type-locality for this species.

Remarks.—*Nymphon micronesicum* is morphologically similar to *N. giraffa* Loman, 1908, *N. aequidigitatum* Haswell, 1884, *N. floridanum* Hedgpeth, 1948, and perhaps is closest to *N. biformidens* Stock, 1974. It shares with the latter species a short main propodal claw with longer auxiliaries with all claws having endal rugosities or tiny denticles, legs and palps with very similar length proportions, and similar trunk and chelifore shapes. The new species differs from *N. biformidens* in having a taller ocular tubercle with prominent lateral papillae, a more cylindrical proboscis, a larger oviger claw without denticulations or rugosities, longer 4th and 5th oviger segments, and more teeth on both fingers of the chela with all chela teeth bicuspidate.

The other 3 similar species share short main claws with longer auxiliaries (those of *N. aequidigitatum* lack endal rugosities), long palp terminal segments, bidentate chela fingers (except for *N. giraffa*), long second tibiae, and long oviger terminal claws without denticulations. The new species differs from *N. giraffa* in having a more compact trunk and appendages, a chela palm which is more cylindrical than globular, a much shorter tarsus in relation to propodal length,

and very different oviger denticulate spines. Both of these species have a constriction or segmentation line around the narrowest part of the neck. This is possibly an artifact due to repeated bending either during the life of the animal or during capture.

Nymphon micronesicum differs from *N. aequidigitatum* in having more slender and shorter chela fingers with many more rounded teeth, a longer tarsus in relation to propodal length, a longer palp second segment, and a different trunk configuration. The new species differs from *N. floridanum* in having a shorter neck without parallel sides, shorter chela fingers with fewer bicuspidate teeth, a more cylindrical proboscis, and a terminal palp segment longer than the third segment and almost equal to the second.

No other known Pacific species of *Nymphon* is as similar to this new species as are the 4 above.

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